Connecticut R1706 Residential Appliance Saturation Survey and R1616/R1708 Residential Lighting Saturation Studies

Final Presentation
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October 18, 2019

Agenda

1. Study objectives
2. Methods
3. Findings and considerations
4. Wrap-up
5. Database tutorial/demo
Objectives

• Characterize Connecticut households
• Develop a database for future research
• Conduct a lighting market assessment
• Provide considerations for planning and PSD updates

Data Collection

• Web surveys
  ➢ Presence, quantity, type, age, configuration of end uses
  ➢ Home characteristics and demographics
  ➢ Behavior, awareness, participation, attitudes

• On-site verification visits
  ➢ Verification of reported end uses
  ➢ Additional details on age, size, efficiency, etc.
  ➢ Lighting saturation and envelope characteristics
  ➢ Usage of advanced power strips
**Additional Tasks**

- **Database development**
  - Web and on-site results combined
  - Billing data amendment
  - Cross-tabulations

- **Adjustment factors**
  - Ratio of web and on-site results
  - Accept if statistical difference and adequate sample

- **Analysis and report**
  - Summary statistics of end uses
    - Penetration and saturation
    - Efficiency and age
  - Exploratory lighting NTG analysis
  - Considerations for future research and planning

**Cross-Project Coordination**

- **R1706 RASS (Part 1)**
  - Customer Contacts
  - Field web survey
  - Conduct single-family site visits
  - Database
  - Perform data validation

- **R1616/R1708 Lighting Impact Saturation Study**

- **R1705/R1609 Multifamily Baseline Study**
  - Conduct multifamily site visits
High-Level Findings and Considerations

- Fossil fuel-based heating is prevalent
- 98% of homes have cooling systems
- Heat pump penetration is low
  - Piloting HP incentives for customers with oil/propane heating is relevant
  - Consider for R1965 HP/HPWH study
- Average/median SF equipment ages differ from PSD EULs
  - Consider updating EULs for furnaces, boilers, RAC, and CAC (X1931 In-Depth PSD Review)
Thermostats

- Only 30% of those with programmable thermostats say they program them
- Smart thermostat penetration (5%) and knowledge are limited
  - Supporting smart learning thermostats is relevant

![Thermostat Usage Chart]

Water Heating

- HPWH penetration is low (1%)
- Technical feasibility in SF homes is high (47%)
  - Current HPWH incentives and efforts are relevant

![HPWH Feasibility Chart]
• ENERGY STAR saturation is low
  ➢ Incentives are relevant
• 20% have secondary refrigerator
  ➢ Explore cost-effectiveness of an appl. recycling prog.

• Differences in assumptions for laundry/dishwashers loads
  ➢ Consider reliability/inclusion into X1931 PSD updates
• 52% of laundry loads use warm or hot water
  ➢ Educate customers about benefits of cold water

• Penetration was low (4%), but opportunities abound
• Penetration in RI (27%) is much higher, likely due to aggressive levels of program activity
  ➢ Support of APS through E-Commerce Platform is worthwhile.
  ➢ Explore including them in HES/HES-IE
• Adjustment factor was very low (0.06), indicating lack of awareness
  ➢ Education on APS is critical for successful uptake
Lighting

- LED saturation increased considerably in a short period, but 43% of sockets still have inefficient bulbs

- Connecticut may not have as much impact on LED sales as neighboring states
- Only 14% of bulbs are ENERGY STAR
- 46% of bulbs in storage are incandescent

➢ Continued promotion of ENERGY STAR-qualified LEDs may be warranted. Yet, federal standards and naturally occurring market adoption may present risk
• Only 2% of homes reported PV solar panels
• 14% had accompanying energy-storage batteries

➢ There is a great deal of space in the market to support solar and energy-storage measures

• Existing housing stock still shows substantial opportunities for improvement
• Unlikely observed changes in single-family building envelope from 2011 to 2018: share of homes with little-to-no insulation increased from 14% to 23%!?  
  ➢ Results imply the need to commission a more comprehensive weatherization study
Wrap-Up
(then the Exciting Tutorial!)

• Method
  ➢ Recruiting through mail with email follow-up and $10 Amazon gift card produced excellent web-survey response rate (8%)
  ➢ On-site recruitment through the survey, with promise of $150 gift card was effective

• Self-reported data has limitations
  ➢ Strong understanding of heating/water heating fuel types, but little about system types
  ➢ Even after seeing photos, there is still confusion between APS and other power strips
• **Purpose**
  - Inform program direction (relevance, opportunities, etc.)
  - Update PSD
  - Conduct advanced analysis (e.g., billing analysis)
  - Act as a baseline for future studies

• **Likely uses for 2019 studies**
  - R1965 HP/HPWH: Fuel/system penetration and HP config.
  - R1959 SF R&A: Fuel/system penetration for prototype models
  - R1982 HVAC/DHW: Sampling
  - X1941 MF Impact: Baseline
  - X1931 PSD Review: Behavior assumptions, EULs, etc.

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• **Objective**: Characterize Connecticut households
  - **Deliverable**: Issued report including summary statistics on end uses and characteristics
  - **Deliverable**: Included extensive cross-tabulations in database

• **Objective**: Develop a database for future research
  - **Deliverable**: Shared database linking case-level primary data with billing data
  - **Deliverable**: Provided user guide as report appendix
  - **Retaining**: Contact info housed on secure site (can be requested via EA Team and shared privately with approved contractors)

• **Objective**: Conduct a lighting market assessment
  - **Deliverable**: Estimated saturation, comparison with neighboring states (with and without programs)

• **Objective**: Provide considerations for planning and PSD
  - **Deliverable**: Provided perspectives and context in report and suggested 2019 studies to leverage
• Exploratory analysis showed differences in NTG between R1616 and R1615

➢ Because inputs are interpolated, values are not recommended

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<th>R1615 Prospective</th>
<th>R1616/1708 Retrospective</th>
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<td>2020</td>
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Note: R1615 values represent recommendations for non-hard-to-reach markets. NTG estimates for hard-to-reach markets were higher. Additionally, the R1616/1708 value excludes stored bulbs.